Zero-gravity Green Propellant Management Technology

Problem Statement

- A new, US-produced green propellant is of interest in the rocket US industry: AFM-315E.
- Surface tension propellant management devices (PMD) are well proven for the hydrazine which this green propellant is to replace but has not been even demonstrated for the new propellant..
- Thus, the TRL of zero-gravity surface tension control of this important new propellant is stuck at level 4.

Technology Development Team

- PI: Prof. Steven H. Collicott, Ph.D.
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  Purdue University
  West Lafayette, IN
- Funding from Aerojet to Purdue.
- Propellant to be acquired by Purdue as in previous industry projects with AFM-315E.

Proposed Flight Experiment

Experiment Readiness:

- The experiment will be ready for flight in late 2014. It is a duplicate of previous and current rocket-flight experiments.

Test Vehicles:

- PLS10 container on UpAerospace Spaceloft XL rocket with de-spin.

Test Environment:

- The weightlessness of the de-spun ballistic phase of the rocket flight is essential for demonstration of the low-gravity surface tension propellant control.

Test Apparatus Description:

- Payload contains two tank models of typical PMDs for orbital and inter-planetary missions plus two reference cases with a benign test liquid. High-def video records the PMDs performance. Photo is of previous rocket-flight version of the hardware being integrated to Armadillo STIG rocket.

Technology Maturation

- The purpose is to demonstrate the surface tension control of the new propellant in weightlessness.
- Static positioning at multiple fill fractions is to be demonstrated
- October 2014 approximately for the flight test.

Objective of Proposed Experiment

- Create the new zero-g testing capability and document performance.
- Flight data is the high-def video of surface tension propellant management device technology demonstrations with the new propellants.
- Demonstrate Static positioning of the liquid.
- AFM-315E is much safer than the hydrazines it replaces, can be handled safely with very minimal precautions.
- Advance the technology to TRL5.

Technology Area TA02 is the initial beneficiary with possible future benefits to TA01.